Math 35, Homework 5 on Sections 15.7 - 15.10
due Wed, Mar 19 at the start of class.

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(1) Evaluate the iterated integral:

$$\int_0^1 \int_x^{2x} \int_0^y 2xyz\, dzdydx$$

(2) Compute the triple integral $\iiint_E y\, dV$ where E is bounded by the planes $x = 0$, $y = 0$, $z = 0$ and $2x + 2y + z = 4$.

(3) Use a triple integral with cylindrical coordinates to find the volume inside both the sphere $x^2 + y^2 + z^2 = 4$ and the cylinder $x^2 + y^2 = 1$.

(4) Plot the point with spherical coordinates $(2, \pi, \pi/4)$ and then find its rectangular coordinates.

(5) Sketch the solid whose volume is given by the integral

$$\int_0^{2\pi} \int_{\pi/2}^{\pi} \int_1^2 \rho^2 \sin\phi\, d\rho\, d\phi\, d\theta$$

and then evaluate this integral.

(6) Let H be the solid hemisphere given by $x^2 + y^2 + z^2 \leqslant 9$ and $z \geqslant 0$. Evaluate:

$$\iiint_H (9 - x^2 - y^2)\, dV$$

(7) Use a triple integral with spherical coordinates to find the volume inside both the sphere $x^2 + y^2 + z^2 = 4$ and the cone $z = \sqrt{x^2 + y^2}$.

(8) For the change of variables $x = uv$, $y = u/v$ find the Jacobian:

$$\frac{\partial(x, y)}{\partial(u, v)}$$

(9) For the change of variables

$$x = \frac{1}{4}(u + v), \quad y = \frac{1}{4}(-3u + v)$$

find the Jacobian:

$$\frac{\partial(x, y)}{\partial(u, v)}$$

(10) Let R be the parallelogram with vertices $(1, 5)$, $(3, -1)$, $(1, -3)$ and $(-1, 3)$. Evaluate the integral

$$\iint_R (4x + 8y)\, dA$$

using the change of variables from question **(9)** above.